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ORIGINAL ARTICLE

Effect of breeding season and pregnancy status on serum progesterone, sodium, potassium, copper and iron of estrous synchronized Aradi goat does

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Abstract Eighteen out of 88 estrous synchronized Aradi goat does were randomly chosen to be bled during May–July (Out breeding season, $n = 9$) and during September–December (Within breeding season, $n = 9$). Estrous synchronization was applied by using a control internal drug release (CIDR) as a reproductive management regimen throughout the year. Nineteen days after CIDR insertion, a 500 IU eCG was injected (i.m.) and CIDR was removed. Does were subjected to fertile bucks 48-60 h after CIDR removal. Jugular blood samples were collected in non-heparinized Vacutainer tubes at 0 h just before CIDR insertion, every 3 days during CIDR insert, at day of CIDR removal, at incidence of estrus and mating, at day 1, 8 and 30 post mating. Data on pregnancy were recorded and serum levels of progesterone (P), sodium (Na), potassium (K), copper (Cu) and iron (Fe) were determined. Progesterone concentration was higher ($p < 0.05$) within (2.85 ± 0.15 ng/ml) than outside (2.37 ± 0.13 ng/ml) the breeding season. Pregnant does exhibited higher ($p < 0.05$) levels of progesterone (2.76 ± 0.17 ng/ml) than non-pregnant does (2.37 ± 0.10 ng/ml). No significant interaction was found between season and pregnancy status on progesterone concentration. A typical progesterone profile was found during treatment days, as levels of P increased during CIDR insertion and declined at CIDR removal and thereafter. Neither breeding season nor pregnancy status affected Na^+ concentration. Contrariwise, mean levels of K^+ was higher ($p < 0.05$) outside (148.34 ± 3.91 mg/L) than within (136.27 ± 3.91 mg/L) the breeding season. Pregnancy status did not influence K concentration. Sodium/potassium (Na^+/K^+) ratio

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was significantly ($p < 0.01$) higher within (30.29 ± 0.44) than outside (27.62 ± 0.44) the breeding season. On the contrary, pregnancy status did not affect this ratio. Iron concentrations neither affected by season nor pregnancy. Likewise, Cu concentrations were not affected by season, however Cu levels were higher ($p < 0.05$) in pregnant (147.75 ± 7.24 μg/L) than in non-pregnant (127.31 ± 5.03 μg/L) does.

1. Introduction

Goats are considered as minor breeds in world animal agriculture. However, goats in the tropical and sub-tropical areas are actually considered important breeds, because of their persistence to the harsh conditions with their demandable good quality meat. Goats raised in Saudi Arabia are of double purpose type since they produce milk and meat. Although such local breeds are seasonally polyestrous (Jainudeen and Hafez, 1993), they can be efficiently utilized all-year round by estrous synchronization and artificial insemination. Biochemical blood estimates in goats are still yet to be clarified under different physiological conditions. Metabolism of mineral substances, which belongs to the basic components of the inside environment, plays a vital role in the regulation of physiological function of puerperal period (Krajničáková et al., 2003). Their concentrations in the blood circulation represent homeostatic mechanisms that are in a close relationship with the neurohumoral regulation. The differences in concentrations of Na and K at time of early and late pregnancy in relationship to season were recorded in Marwari sheep (Mali et al., 1994). Therefore, the objective of the present study aimed to investigate the effect of the breeding season and pregnancy status on progesterone profile and serum levels of sodium, potassium, copper and iron in estrous synchronized – Aradi goat's does.

2. Materials and methods

2.1. Animals

Eighteen primiparous Aradi does were randomly allotted into two groups, 9 does were utilized in the breeding season and 9 does were utilized outside the breeding season. Does were housed in a semi-open yard, offered 300 g/head of a pelleted concentrate (16% crude protein) and alfalfa hay and accessed clean drinking water. Sire bucks were housed in separate pens and brought to females at time of estrus for natural mating.

2.2. Does reproductive management

Does were submitted to a regular regime of estrous synchronization (Fig. 1) using CIDR (Pfizer, Auckland, New Zealand) containing 1 g progesterone. CIDR was inserted for a 19 day – period and at day 19 CIDR was removed and a 500 IU equine Chorionic Gonadotropin (eCG) (Pregnecol®, BIONICHE Animal Health, Australia) was intramuscularly (i.m.) injected for each doe. Bucks were introduced just at time of CIDR removal. Mean time interval between CIDR removal until the exhibition of estrus signs was 55 h, either within or outside the breeding season.

2.3. Experimental design

See Fig. 1.

2.4. Blood sampling

Jugular venipuncture was used by an 18 – gauge 1.5 in. sterile syringe. Time schedule of blood sampling (Fig. 2) commenced at day 0 (just before CIDR insertion), every 3 days until day of CIDR removal, at day of CIDR removal, at onset of estrus and at day 8 and 30 post mating. At day 30 post mating all does were exposed to pregnancy diagnoses by ultrasonography using 5 MHz trans-rectal linear array probe (ALOKA, Japan). The time schedule of blood sampling was as follow.

2.5. Serum collection

Blood was collected in non-heparinized Vacutainer® tubes, cooled for 2 h at 5 °C and centrifuged under cooling (Hettich Universal 32R, Germany) at 4000*g* for 15 min. Sera were harvested, labeled and kept frozen (−70 °C) until assayed.

2.6. Progesterone determination

Progesterone levels in serum were determined by the use of progesterone – EIA kits (Syntron Bioresearch, CA, USA) according to the method of Radwanska et al. (1978). Horse-radish peroxidase was used as a tracer and tetra methyl benzidene (TMB) as a chromogen. The intra- and inter-assay coefficient of variations were 7.6% and 7.3%, respectively. The crossreactivity for progesterone was 100%.

2.7. Sodium, potassium, iron and copper determinations

A 500 μl aliquots of serum were prepared for each element and diluted by glass double distilled water at a dilution rate of 1:10 (serum:water). Determinations of the concentrations of these elements were done using an atomic absorption flame emission spectrophotometer (AA – 6200, Shimadzu, Kyoto, Japan).

2.8. Statistical analysis

Data were analyzed using GLM procedure of SAS program (SAS, 2000). The linear model used was:

$$Y_{ijklm} = \mu + S_i + P_j + SP_{ij} + D_{ijk} + C_l + e_{ijklm} \quad (1)$$

where, Y_{ijklm} = Observation on ijklmth trait, μ = overall mean, S_i = fixed effect of ith season, P_j = fixed effect of jth pregnancy status, SP_{ij} = effect of interaction of $S_i \times P_j$, D_{ijk} = random effect of kth doe within subclasses of SP_{ij}, C_l = fixed effect of lth sample collection day, e_{ijklm} = random error.